

DDT and DDE in Blood and DDA in Urine of Men Exposed to 3 Percent DDT Aerosol

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RESIDUES of the insecticide DDT have been observed in all tissues of man, and of most other animals, throughout the world (1-3). Relative magnitudes of these residues have been correlated with exposure to DDT and man's absorption of the chemical, especially by the oral route (4). Blood levels of DDT and its metabolite DDE and urinary DDA excretion have been studied in relation to known exposure situations; poor correlations with acute exposure were observed, and biological differences among individual persons were found to be very important in assessing variations in levels of these chemicals in blood and urine (5) after acute exposure.

Blood levels of DDE were found to be stable and to correlate well with estimated long-term exposure to DDT (6); useful epidemiologic information has been acquired by comparisons of DDE levels in various population groups (7).

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On the other hand, DDT concentrations in blood were unstable and more related to recent exposure (5, 6). Urinary DDA excretion rose and fell rapidly as the levels of DDT in blood rapidly increased and decreased following acute exposure. DDA has been observed uncommonly in urine from persons who have had no recent significant exposure to DDT (8).

A study of the effect of occupational exposure to an aerosol containing 3 percent DDT and 1 percent pyrethrin on the levels of DDT, DDE, and DDA is reported here. The concentrations in blood and urine specimens from four men were measured and related to the amounts of aerosol used and the actual time the men sprayed the material in the interiors of commercial aircraft to control insect vectors. The method of absorption of DDT presumably was almost entirely respiratory.

Materials and Methods

We recorded the time the men spent in spraying the amount of aerosol each used in the period of one 4-day work week. Personal data showed that they had not been exposed to the aerosol in the 4 days before the study was started. In the previous year, blood samples had been obtained at random from three of the men; thus reference levels were available for the current study.

Specimens of blood and urine were obtained

from each man four times on the initial day. Thereafter for 3 days a blood specimen was collected at the end of each day and a urine specimen three times a day. On the seventh day, blood and urine specimens were collected.

Heparinized whole blood samples were analyzed in the Miami Pesticides Laboratory of the Florida State Board of Health, according to the Nachman modification (9) of the method described by Dale and co-workers (10). The concentration step was excluded and a blood-to-hexane ratio of 1:1 was used for extraction of whole blood. Further dilutions were made as required so that peaks remained within the linearity of the gas chromatograph. Results are reported in parts per billion (ppb) of whole blood.

Urine was analyzed for DDA by the Primate Research Laboratory at Perrine, Fla., according to a method devised by Cranmer and co-workers (11). Concentrations were corrected to an osmolality of 1,000 mOsm per liter for comparability and are reported in parts per billion.

Analysis of the aerosol by gas chromatography showed approximately the amount of DDT (3 percent) stated on the label.

Results

Personal data, previous levels of DDT and DDE for three men, and initial values and ranges from the current study are shown in the table. Sequential levels of DDT and DDE concentrations in blood and of DDA in urine are presented in the chart. Also shown are the time (in minutes) spent spraying and the amount of aerosol used. None of the men wore protective clothing or used other devices to minimize exposure.

After the first day we found little or no relationship between the levels of DDT and DDE and the amount of aerosol used and spraying time. The concentration of DDA related slightly to spraying time and had a discernible, but unpredictable, relationship to DDT or DDE levels or both. Based on results of the previous study of three of these men, a strong relationship existed between present levels of DDT and DDE and years of their occupational exposure. After the first day, concentrations in their blood stabilized at higher levels than they were initially.

Operator A had little change in DDT and

DDE levels during the study, even on the initial day (see chart). During the work week he used 96 ounces of aerosol in a total spraying period of 2.8 hours. DDT and DDE values were comparable to those found in the white general population of the area (7) ($\overline{DDT} < 4$ ppb, $\overline{DDE} < 9$ ppb, $\overline{DDA} < 2$ ppb); however, DDA levels were higher than in the general population but less than in the other workers.

On the first day, operator B showed a rise of 9 ppb in DDE levels and 14 ppb in DDT levels; thereafter DDT levels stayed within 4 ppb and the DDE levels within 5 ppb of a mean level (see chart), including the seventh day. Within 4 days he sprayed 144 ounces of aerosol in 3.6 hours.

In operator C, DDT rose 11 ppb and DDE 7 ppb on the first day. Small increases and decreases within 10 ppb of a mean level occurred until the end of the work week (see chart). DDT and DDE had become stabilized at initial levels by the seventh day. Over a period of 3.4 hours he used 144 ounces of aerosol in the work week.

Within 2 hours after beginning work on the first day, operator D had a 24 ppb rise in DDT and a similar rise in DDE (see chart). Both levels then remained within 5 ppb of their mean level until the end of the work week. His actual spraying time was 3.6 hours, and the amount of aerosol was 156 ounces. On the seventh day, the DDT level was rapidly approaching the initial level; however, DDE remained considerably elevated but similar to the mean level recorded during the work week. In contrast to the other men, the initial and subsequent DDT levels were higher than the DDE levels.

Discussion

It appears that DDT, DDE, and DDA concentrations were unrelated to either the amounts of aerosol used in a day or to time spent in actual spraying. The only significant increases in DDT or DDE levels occurred on the first day in three workers (B, C, and D). The relationship of concentrations in blood to length of prior experience was notable. We encountered similar findings in a study of pesticide formulators following a single exposure to DDT (5).

Changes in DDT, DDE, and DDA levels in

operator A, age 47, were unimpressive. He had been working sporadically as a sprayer for 2 years and was the only one who attempted to avoid the aerosol. Also, he used somewhat less of it in a day.

Operator B, age 37, the youngest of the group, had been an aircraft sprayer for 4 years. He worked about 3 to 4 days each month, the same as operator A, and used 36 ounces of aerosol each day of our study. His DDT and DDE levels rapidly stabilized and DDA levels rose and fell more regularly in response to increasing DDT concentration. The rapid modest rise of DDA within 2 hours after starting work on the first day and the dynamic regularity of subsequent DDA levels may represent a more sensitive and efficient DDA producing enzyme system. The DDT and DDE levels remained stable at a low level even with continued exposure of the same magnitude as operators C and D.

Operator C, 51 years old, had been a sprayer for 5 years and worked about 8 days a month. On the first day of the study, his DDA excretion increased dramatically and DDT and DDE levels increased modestly. During the succeeding 3 days DDA concentrations rose and fell sharply, responding generally to rises in circulating DDT. Excretion of DDA appeared to stabilize DDT and DDE concentrations despite continued exposure.

Levels of DDT, DDE, and DDA for operator D were the most mobile but demonstrated a pattern similar to that of the other men. This 60-year-old man, a sprayman for 14 years, worked regularly several days each week. His random DDT and DDE blood values were higher than for the other men and the DDT levels were higher than DDE levels. On the first day of the study his workload was considerably greater than that of the other men; after the first day, DDT and DDE levels became relatively stable. Between the fourth and seventh days, the DDE level remained elevated and the DDT level approached the initial concentration. Responding within 2 hours after he began work on the first day, DDA excretion did not rise as high nor remain as elevated as for operator C, who was exposed only to half as much aerosol. A much greater rise in DDA occurred on the second day and the level remained erratic during the 4 days, although related to rising levels of DDT and DDE.

Induction of the DDA producing enzyme system appears to occur as a response to the rapidly changing concentration of circulating DDT. In the oldest sprayman (operator D) the enzyme system seemed less efficient in maintaining stable DDT levels and, indirectly, DDE levels. Whether this can be attributed to more frequent and longer exposure or age has not been determined. Obviously, biological factors

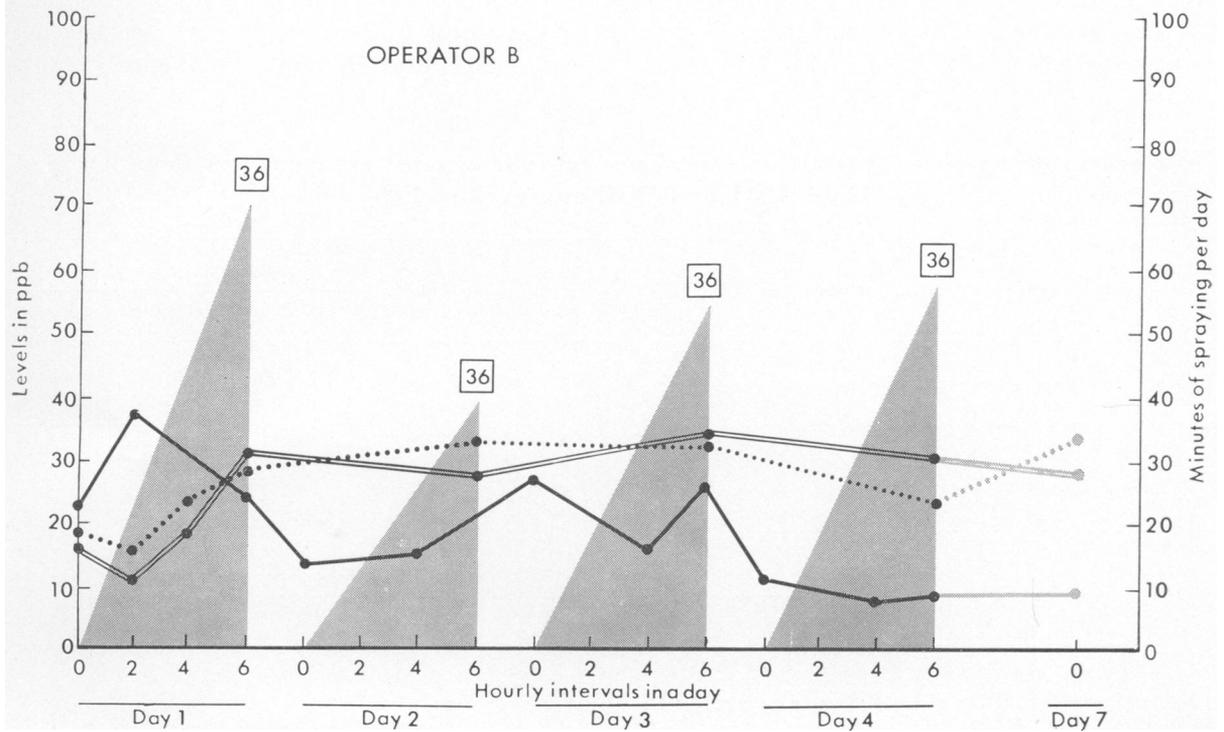
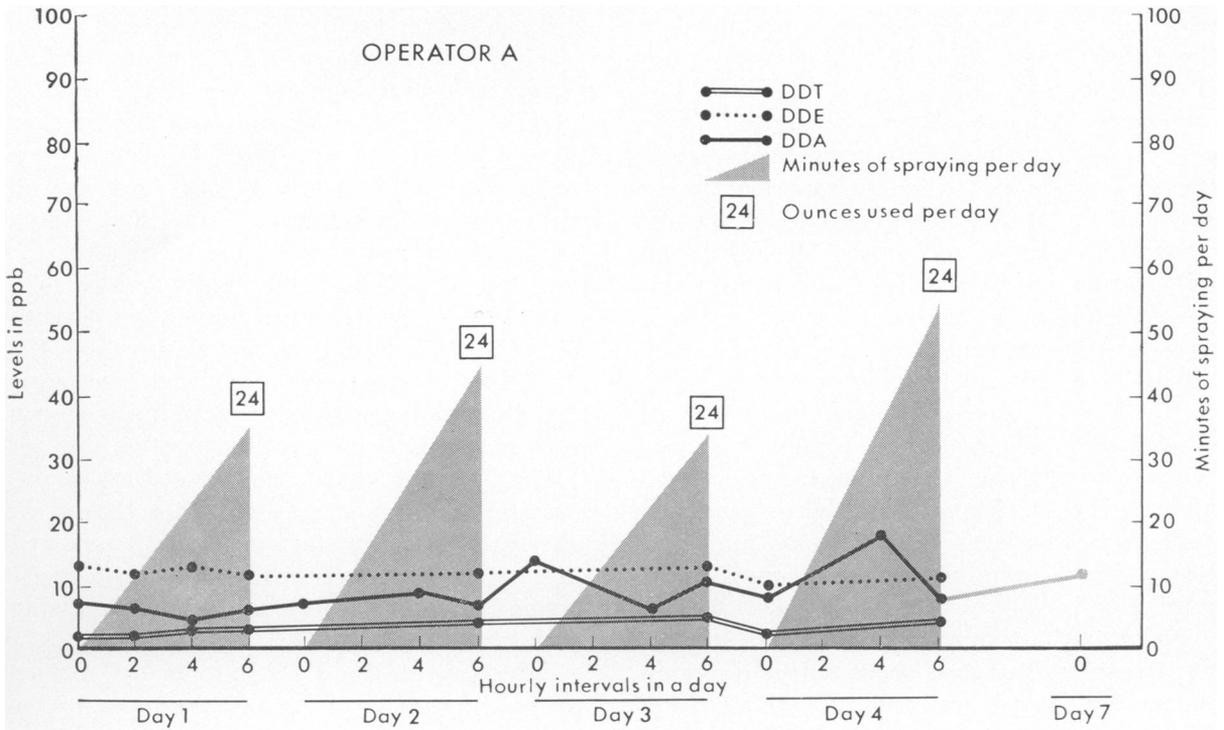
Comparison of number of years of experience of four aircraft sprayers and their levels of blood DDT and DDE and urinary DDA

Operator and years of experience	DDT (ppb)	DDE (ppb)	DDA (ppb)	Range in study (ppb)		
				DDT	DDE	DDA
A, age 47: 2.....	¹ <4	¹ 13	¹ 7	<4	10-13	3-18
B, age 37:						
3.....	17	15				
3½.....	15	12				
4.....	¹ 16	¹ 19	¹ 22	11-33	16-33	9-37
C, age 51:						
4.....	20	28				
5.....	¹ 19	¹ 42	¹ 17	19-49	22-72	17-72
D, age 60:						
12.....	23	48				
13.....	34	20				
14.....	¹ 56	¹ 37	¹ 19	56-87	37-66	19-80

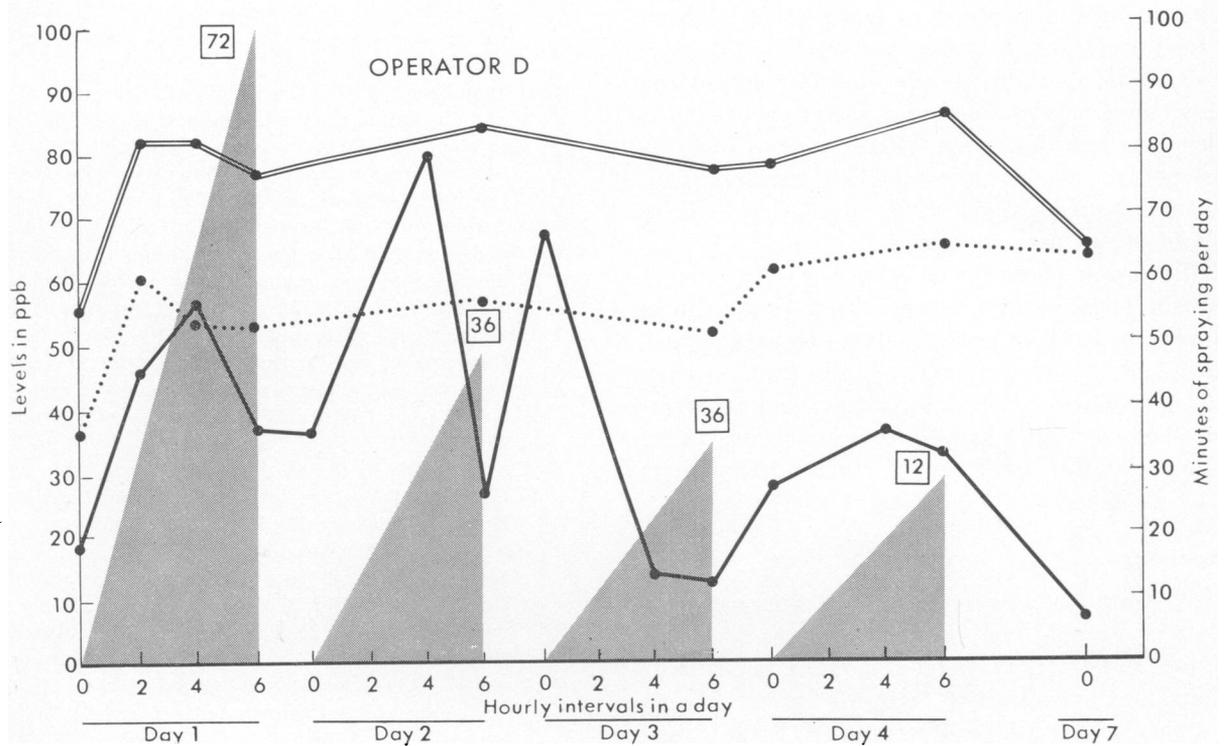
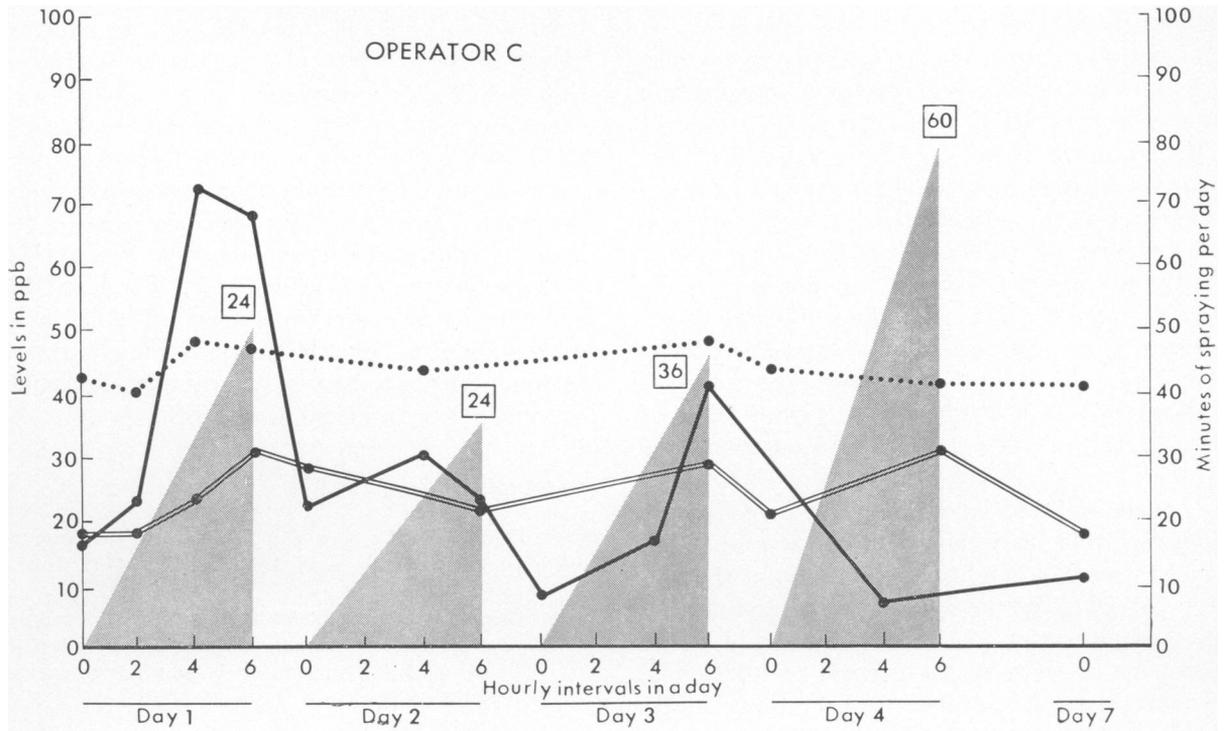
¹ Initial value in present study.

NOTE: Parts per billion of DDA were corrected to an osmolality of 1,000 mOsm per liter.

Sequential levels of DDT and DDE concentrations



in blood and of DDA in urine



are highly important. The levels seem more a characteristic of the person than a result of the exposure, whether single or continuous.

Length of absorption (lifetime) appears to be the most important single factor in interpreting the height of DDE levels, the most stable of DDT indicators, and is characteristic of the man whether occupationally or nonoccupationally exposed (6, 7). With continuing dosage, the amount of DDT and DDE stored in the body indicates the degree of accumulation while blood levels of DDE are more indicative of the degree of saturation of body tissues, especially fat. These blood levels have been shown to correlate ($r=.62$, $P<.001$) with adipose DDE or total DDT (DDT+1.11 DDE) concentrations (12).

Levels of DDE in the blood of persons with long and relatively consistent exposure to DDT tend to reach a height characteristic of the balance of DDT intake and excretion and the degree of saturation of tissues. This would be the situation of those in the general population in whom balance of intake and excretion usually is reached by age 10 (7). Later, DDE levels rise or fall from this balance according to absorption of larger or smaller amounts of DDT.

This probably explains the observed (mean) rise in children to about 10 years of age (in both blood and fat), followed by a gradual decline to the (mean) adult levels characteristic of the environment and particular social group. Children, as crawlers and toddlers, would be expected to absorb more DDT from environmental sources, excluding food, than adults from house dust and other soil.

Evidently excretion of DDA is a safety mechanism. It plays only a small role in maintaining levels of DDT in persons in the general population, but appears vitally important to keep circulating concentrations of the chemical down in those acutely exposed or who absorb large doses of DDT over short or extended periods of time.

Summary

A study was undertaken to determine the effect of occupational exposure on the levels of DDT and DDE in blood and DDA in urine of four men who sprayed aircraft interiors with an aerosol containing 3 percent DDT and 1 per-

cent pyrethrin daily during 4 days. After the first day little or no relationship was seen between levels of DDT and DDE and the amount of aerosol used or actual spraying time. Excretion of DDA correlated only slightly to amounts or spraying time. Relative heights of DDT and DDE in blood related more to biological differences of the men and to previous exposure. Levels of DDE are considered to reflect the length of lifetime absorption of DDT, degree of tissue saturation by DDT and DDE, and the intake-excretion balance of DDT and its metabolites. The DDA producing enzyme system appears to respond to rapidly changing concentrations of circulating DDT.

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Tearsheet Requests

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Nutrition Activities Now Part of RMP Service

Five priority items were set by the combined task forces reviewing the results of the White House Conference on Food, Nutrition, and Health held December 2-4, 1969, and some activities related to these will be undertaken under the aegis of Regional Medical Programs Service.

The five priorities were these:

1. A national emergency in hunger and malnutrition be declared today in America.
2. A guaranteed adequate income with a floor of \$5,500 annually for a family of four be considered for appropriate legislation.
3. An interim food program reforming and expanding current inadequate or missing programs be instituted for those in need.
4. Universal school food programs of free breakfasts and lunches be immediately made available to all children who need them.
5. All administrative responsibility for hunger and nutrition programs be shifted from the Department of Agriculture to the Department of Health, Education, and Welfare with corresponding shifts in congressional committee responsibilities.

The Nutrition and Health Program, transferred to the Regional Medical Programs Service from the National Center for Chronic Disease Control, has been conducting a 10-State nutritional survey to ascertain nutritional health status in America. With \$6 million available, the objectives of the program also include

the development, testing, and evaluation of procedures and guidelines for incorporating nutrition into current or contemplated systems for delivery of health care, food, or related educational efforts.

In addition, the Nutrition and Health Program is in the process of expanding its program by establishing a Nutritional Clearinghouse. As an integral part of Regional Medical Programs Service, the clearinghouse will be the primary supporting agency for health-related community nutrition activities to coordinate the multiple resources required to deal with problems of nutrition and health.

Current plans are to establish community demonstration projects developed in collaboration with organizations already involved in primary health care planning and operational activities at the regional and community levels to permit nutrition to be viewed with the total framework of personal health. These projects will be funded on a contract basis with a total of \$2.7 million which has been made available.

The clearinghouse will also provide technical assistance and limited support for nutrition surveys and surveillance, development of pilot demonstration programs in community nutrition programs, nutrition education programs, establishment of nutrition competency in medical schools and for practicing physicians, identification of nutrition knowledge gaps, and the initiation of research programs through selected universities and other institutions.

Four Grants Awarded to Solve Problems in Solid Waste Management

The Environmental Control Administration, Bureau of Solid Waste Management, has awarded four research grants for the following projects: to Drexel Institute of Technology, a \$51,437 first-year grant to support the investigation of a novel system of handling animal wastes; to Louisiana State University's School of Civil Engineering, a \$74,449 grant to support research on various micro-organisms that can degrade cellulose waste into a low cost, high protein food; to the University of Illinois in Urbana, a \$40,390 grant to support the first year of a 3-year investigation which promises an economical way of reclaiming energy—methane gas—from waste materials while reducing the amounts of organic wastes to be disposed of by as much as 50 percent; and to the University of Michigan, Ann Arbor, a \$40,452 grant to support the first year of a 3-year project in which researchers are analyzing toxic and corrosive gases produced by the incineration of everyday plastic items.

Since most traditional methods for disposing of both animal and organic wastes—lagooning, digesting, incineration—mean some health nuisance problem, such as insects, odor, or water and air pollution, the Bureau, a component of Consumer Protection and Environmental Health Service, Public Health Service, has awarded these grants to subsidize researchers in innovative approaches.

Animal Wastes

The 3-year research project at Drexel's department of chemical engineering is headed by Dr. Elihu D. Grossman. The waste handling system uses superheated steam as the drying agent. Animal wastes, such as manure, flow

from a collecting sump to a hold tank. From there the manure passes, at a steady rate, into a continuous blender and mixes with recycled dry solids. Blending provides a uniform feed, for more stable operation, and also reduces the inlet moisture content to permit a smaller dryer. The dryer may be a continuous screen-conveyor or fluidized bed.

The steam-dried end product is discharged through a vapor lock into a bin. The vapors, which contain much of the volatile material in the feed and the moisture removed in the dryer, are partially condensed by either water or air-cooled condensers. The remaining vapor is re-superheated in a shell-and-tube heater and recycled. The entire processing system would be self-contained inclusive of the discharge of a sterile, dry, deodorized product. This dry product would be easily handled, possibly as an animal feed, fertilizer, soil conditioner, or fuel for the system to produce steam.

Micro-organisms that Degrade Cellulose

The grant to Louisiana State University will support research to isolate and identify other micro-organisms that can degrade cellulose. University engineers had previously designed a pilot plant that turns cellulose waste into a low-cost, high protein animal food. A \$73,892 contract from the Bureau subsidized its design and construction. With the most recent grant to LSU, researchers will seek to refine the processing techniques and the analysis of the protein products for digestibility and nutritional value.

Cellulose products constitute an appreciable part of agricultural, industrial, and municipal wastes. In the pilot facility, the waste—at present sugar cane bagasse—is ground, chemically

treated, sterilized, and fed into a fermenter, where the micro-organisms degrade and metabolize the cellulose.

The dried micro-organisms contain about 50 percent crude protein. This edible end product—a single-cell protein—is straw-colored and has the texture of rough flour.

According to Dr. Clayton D. Callihan, Louisiana State University's project director, micro-organisms are far more efficient than livestock in converting cellulose matter into protein. A young pig, for example, doubles its weight in 2 weeks; a yeast cell takes only 2 hours; and bacteria take even less time.

Reclaiming Methane from Organic Wastes

If the 3-year research project at the University of Illinois' College of Engineering, headed by Dr. John T. Pfeffer, associate professor of sanitary engineering, is successful, organic solid wastes—food, paper, garden trimmings—may prove to be an untapped energy source in the form of methane or natural gas. The residue from the proposed fermentation process would be an innocuous humus.

The conversion of organic solids to gases by anaerobic fermentation—where micro-organisms that thrive without oxygen metabolize waste materials—has been widely used to reduce waste sewage sludges.

The researchers at the University of Illinois will also investigate the most favorable conditions for using the fermentation process to reclaim methane gas from residential wastes. The major operating parameters that they hope to

define, working with controlled laboratory systems, are the optimum concentration of solids, retention times, and temperatures for effective methane gas production.

Incinerating Plastic Items

The result of the research at the University of Michigan on the incineration of plastic items will enable environmental engineers, in designing incinerators, to anticipate and deal with potential air pollution. The research project is headed by Edward A. Boettner, associate professor of the university's school of public health.

The use of plastics in packaging, toys, furniture, and automobiles has increased tremendously in the last two decades. Plastic production in the packaging industry alone rose 550 percent from 1958 to 1966.

Disposing of discarded plastic objects is troublesome. They do not decompose readily, if at all, in sanitary landfills, and municipal incinerators are not adequately designed to burn them sufficiently and safely.

In their analysis, researchers will isolate and qualify particularly toxic or corrosive products that the more recently developed plastics—polysulfone, polycarbonate, methyl methacrylate—as well as earlier developed ones—polystyrene, polyvinyl chloride, polyethylene, polypropylene—emit when burned at various temperatures, air flows, and heating rates. The researchers also will look for the most favorable conditions, if such an ideal situation does exist, for complete incineration of plastics.

Education Notes

Control of Infections in Health Care Facilities.

A course in control of infections in health care facilities will be presented at the National Communicable Disease Center, Public Health Service, Atlanta, Ga., June 8-12, 1970.

Directed to public health sanitarians who share responsibility for curbing infection through control activities in hospitals and similar institutions, this course is intended particularly for persons who are assuming these responsibilities for the first time.

Following a discussion of hospital environment and administrative organization, the course will emphasize concepts of surface sanitation, air hygiene, laundry handling and processing, and general house-keeping. Topics will be presented by lecture and through conference, demonstration-application, problem solving, and panel discussions.

For further information write to the National Communicable Disease Center, Public Health Service, Attention: Director, Training Program, Atlanta, Ga. 30333.

Graduate Summer Session in Epidemiology.

The University of Minnesota will offer a graduate summer session in epidemiology at the Nolte Center for Continuing Education, Minneapolis, from June 21 to July 11, 1970. Sponsored by the epidemiology section of the American Public Health Association and the Association of Teachers of Preventive Medicine, the program will be supported by the Bureau of Health Manpower, Public Health Service.

These sessions are designed primarily for teachers in medical schools, but postdoctoral fellows, graduate students, and residents in medical specialties, particularly preventive medicine, may qualify. Teachers, postdoctoral fellows, and graduate students in schools of public health, dentistry, and veterinary medicine also are eligible as are qualified personnel of official health agencies.

In general, the 1970 session will follow the pattern previously established. In addition to fundamentals of epidemiology and of biostatistics, epidemiology of cardiovascular diseases and of in-

fectious diseases, genetics and epidemiology, selected statistical topics in epidemiology, and epidemiology of mental disorders, two new courses will be offered: health survey methods and radiation epidemiology.

Tuition is \$120. Special rates for lodging in downtown hotels and meals (luncheons and evening dinners at the center) have been arranged.

A limited number of stipends for tuition and \$336 are available to U.S. citizens or persons who have filed declaration of intent. Federal employees or persons on a Federal traineeship are ineligible for stipends. No travel allowance will be available.

Further information and application forms may be obtained from Leonard M. Schuman, M.D., Director, Graduate Summer Session in Epidemiology, University of Minnesota School of Public Health, 1158 Mayo Building, Minneapolis, Minn. 55455.

Ph.D. Program in Urban and Regional Planning. The University of Michigan is offering an interdisciplinary program leading to a doctoral degree in urban and regional planning.

The curriculum, under the direction of the program committee on urban and regional planning, combines the faculties and the research and teaching facilities of the college of literature, science, and the arts, college of engineering, school of natural resources, law school, school of education, college of architecture and design, school of public health, and school of business administration.

The period of study for students qualifying for regular admission would typically involve no less than 2 nor more than 3 years of full-time coursework. There are no general language requirements although the doctoral program committee may request competence in a foreign language if the applicant plans research outside the United States.

The basic requirement for admission is evidence of an undergraduate degree completed in high standing. Although less time and fewer courses may be required of those experienced in professional planning or having degrees in related fields, such as

economics or political science, the program is designed to accommodate almost any undergraduate major.

Applicants for the degree program must demonstrate competence by completing formal coursework and through satisfactory performance on qualifying examinations with five core subject-matter areas—environmental design and resource appraisal, analytic tools for urban and regional analysis, social group interaction processes, economic development of urban and regional areas, and governmental planning process.

Scholarships, research fellowships, teaching fellowships, and traineeships are available to applicants with superior qualifications.

Further information and application forms are available from the Admissions Office, Horace H. Rackham School of Graduate Studies, University of Michigan, Ann Arbor, Mich. 48104.

Graduate Program in Air Pollution. The University of North Carolina School of Public Health is offering a graduate program in air pollution leading to a master of science, master of science in environmental engineering, master of science in public health, or doctor of philosophy degree.

Students may select receptor, source, or system oriented air pollution programs and courses in other school and university facilities including biostatistics, city and regional planning, and epidemiology; and in other universities comprising the Triangle Universities Consortium on Air Pollution (Duke and North Carolina State Universities).

Admission requirements are a degree in engineering or a science and acceptable academic record,

GRE scores, and references. Financial assistance can include stipends, tuition, fees, and allowance for dependents.

Additional information is available from Prof. Arthur C. Stern, Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, N.C. 27514.

Graduate Program in Environmental Health Engineering. The University of Texas at Austin offers a graduate program in environmental health engineering directed to candidates for the master of science or doctor of philosophy degrees and to post-doctoral fellows.

The program, accredited by the Engineering Council for Professional Development, includes curriculums in water resources, air resources, and general environmental health engineering. Specialized studies emphasized in courses and research projects are wastewater treatment and renovation, sanitary engineering design and planning, water resources management, water supply, air pollution control management, solid wastes management, radiological health, and industrial hygiene.

Financial support for qualified students is available in all of the specialty areas through fellowships, traineeships, and research and teaching assistantships.

Additional information is available from Prof. Earnest F. Gloyna, Engineering Laboratories Building 305, University of Texas, Austin, Tex. 78712.

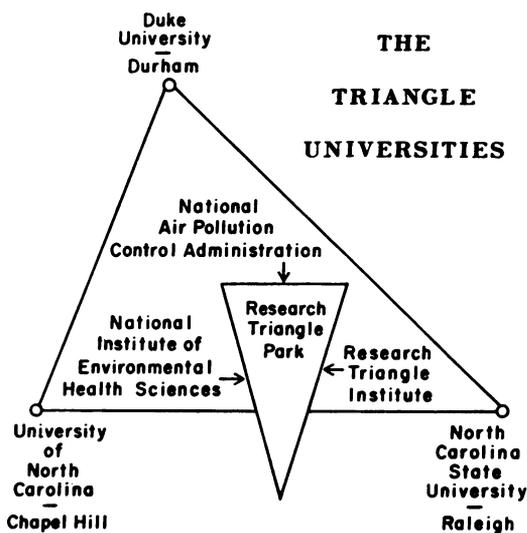
Summer Program in Human Sexuality. The Institute for Sex Research is offering a program in human sexuality, July 19–31, 1970.

Included are a general lecture course, task groups to promote awareness of sexual attitudes and their role in sex education and counseling, and a workshop in techniques of sex education.

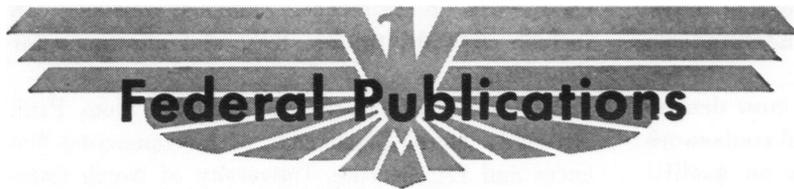
A certificate of attendance, but no university credits, will be awarded for completing the course.

The \$325 cost includes housing. Registration ends May 30.

For additional information write Summer Program, Institute for Sex Research, Indiana University, Bloomington, Ind. 47401.



Announcements for publication should be forwarded to Public Health Reports 6 months in advance of the deadline date for application for admission or financial aid, whichever is earlier.



Grant Programs in Dental Public Health. *PHS Publication No. 1225E; revised 1969; 13 pages.* Describes available means of support for research and research training activities related to the field of dental public health. Discusses the research programs in detail, listing the purpose, areas of high priority, eligibility requirements, and when and how to make application for a grant. Gives information for research grants, research training grants, and research fellowships supported by the Division of Dental Health, Bureau of Health Professions Education and Manpower Training, National Institutes of Health.

Chairside Psychology in Patient Education. *1969; 200 pages; \$1.* Presents a self-instruction course developed by the Division of Dental Health, National Institutes of Health, to give practicing dentists, dental hygienists, and dental assisting students basic information regarding present-day principles of education. Deals largely with tooth-brushing; however, the practitioner should be able to apply the same principles in teaching his patients other habits and skills necessary for good oral hygiene and dental health. Helps the dentist to communicate knowledge of dental health to his patients and to stimulate the desired motivation and changes in attitudes.

Drug Distribution in Hospitals. Today's requirements and tomorrow's outlook. *PHS Publication No. 950-C-19; June 1969; 27 pages; 35 cents.* Reprinted from *Hospitals*, Journal of the American Hospital Association, vol. 42, No. 23, pp. 45-82, Dec. 1, 1968. Presents six papers given at conference on "Administrative Solutions to Drug Distribution Problems." Covers the hospital administrator's responsibility for drug distribution, legal responsibilities, tail-

oring pharmacy systems to current technology, unit-dose systems, and automated processing of drug distribution.

Training Methodology. Background theory and research. An annotated bibliography. *PHS Publication No. 1862; Part I; 1969; 90 pages; \$1.* The first in a four-part series, this bibliography pertains to research and theory on individual behavior, group behavior, and educational and training philosophy. References in all four parts are arranged in classified order, annotated, and indexed.

Training Methodology. Planning and administration. An annotated bibliography. *PHS Publication No. 1862; Part II; 1969; 119 pages; \$1.* Pertains to aspects of instructional design, course planning, and training program administration.

Training Methodology. Instructional methods and techniques. An annotated bibliography. *PHS Publication No. 1862; Part III; 1969; 99 pages; \$1.* Presents references pertaining to specific instructional methods and techniques. Contains selected references on methods and techniques for individuals and groups.

Training Methodology. Audiovisual theory, aids, and equipment. An annotated bibliography. *PHS Publication No. 1862; Part IV; 80 pages; 75 cents.* Cites references to the media aspects of training and contains selected references on audiovisual theory and methods, aids, facilities, and equipment.

Use of Tobacco. Practices, attitudes, knowledge, and beliefs, United States, fall 1964 and spring 1966. *Public Health Service, National Clearinghouse for Smoking and Health. July 1969; 807 pages.* Provides statistics on the incidence of the use of tobacco, particularly the

smoking of cigarettes, attitudes toward the use of tobacco, and other related variables. Reports basic data from two national surveys on use of tobacco. The first survey was conducted by National Analysts, Inc., in fall of 1964 and the second was conducted by the National Analysts, Inc., and Opinion Research Corp., spring 1966. Presents frequency (and percentage) of response of each question but does not provide analysis and interpretation of survey results. Questions cover a number of topics felt to be related to cigarette smoking and cigarette smoking control.

Radiological Health Handbook. *PHS Publication No. 2016; 1970; 458 pages; revised.* Contains a new chart of nuclides. Also contains, for the first time, a universal decay table instead of individual isotope listings, microwave and laser glossaries, film-speed charts, depth-dose tables, and "rules of thumb" for common properties of alpha, beta, and gamma radiation.

Population Dose From X-Rays, U.S., 1964. *PHS Publication No. 2001; October 1969; 143 pages; \$1.25.* Presents estimates of gonad and genetically significant doses from diagnostic medical X-rays for the population of the United States. Describes laboratory-based dosimetry and methods of calculation. Includes 22 tables and represents the first publication in an official source of such data for the United States.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C. 20201.

The Public Health Service does not supply publications other than its own.

WRIGHT, NICHOLAS H. (Population Council, New York City): *Vital statistics and census tract data used to evaluate family planning. Public Health Reports, Vol. 85, May 1970, pp. 383-389.*

From 1962 to the end of 1966, the Emory University Family Planning Program in Atlanta, Ga., provided for the contraceptive needs of about 12,000 to 15,000 new patients in a post partum clinic at Grady Memorial Hospital. Available information on census tract of mother's residence and birth rate data were used to evaluate the progress of the family planning program.

Live births at Grady were identified by race and census tract of mother's residence. Census tracts were then grouped according to the proportion of nonwhite births occurring at the hospital. Calculations of birth rates in the grouped tracts demonstrated declines related to the proportion of births at the hospital. Differences among the birth rates of the grouped tracts decreased over

the time period examined. Since the method of grouping may have socioeconomic implications (more or less persons eligible for charity care), this observation suggested that family planning services were reaching the disadvantaged among the target population.

The timing of the birth rate decline supported the proposed effect of the program on the target population. Following the introduction of modern contraceptives, particularly the intrauterine device, the birth rate decline among nonwhites increased threefold.

ROBINSON, MARY H. (Ohio Department of Health), HICKS, CLAYTON, and DAVIDSON, GARY: *Use of vancomycin, colistimethate, nystatin medium to transport gonococcal cultures. Public Health Reports, Vol. 85, May 1970, pp. 390-392.*

Vancomycin, colistimethate, nystatin medium served as primary culture and transport medium for 768 gonococcal specimens mailed to the Ohio Department of Health's division of public health laboratories for examination. Using the fluorescent

antibody (FA) test, 193 direct smears were examined also.

Only 46, or 6 percent, of the 768 specimens were positive by all tests, the direct FA, delayed FA, and Gram's stained smear and subculture. Twenty-seven, or 14.1 percent,

of the slides submitted for direct examination were positive.

Cultural procedures combined with fluorescent antibody techniques on 768 specimens produced a higher percentage of positive results than would have been derived from either the direct Gram's stained smear, direct FA examination, or by culture alone. Fermentation studies were used to confirm morphologically positive cultures.

REINHARD, KARL R. (Indian Health Service, Public Health Service), FELSMAN, FRANCIS W., and MOODY, LUCILLE F.: *Time loss and indirect economic costs caused by disease among Indians and Alaska Natives. A comparison with the general U.S. population. Public Health Reports, Vol. 85, May 1970, pp. 397-411.*

A comparison was made of the utility and relevance of using data on mortality, hospitalization, physician visits, and restricted activity (disability), as well as computations of time loss and indirect economic

cost caused by these factors, in the appraisal of health needs of and the development of comprehensive health care programs for Indians and Alaska Natives. The overall objective of the study was to develop

statistical approaches for linking measures of health status of a population and for computing indices of social and economic impact of disease.

The data and comparisons showed a large health deficit for the Indians and Alaska Natives in relation to all races. Thus, a need is indicated for continued improvement in the quality and quantity of health services provided to these disadvantaged people.

DARNEY, PHILIP D. (Public Health Service): *Attitudes of married college students on overpopulation and family planning. Public Health Reports, Vol. 85, May 1970, pp. 412-418.*

Twenty University of California third year medical students and their wives and 20 students from San Francisco State College and their wives were selected and interviewed to assess their family size aspirations and attitudes toward family planning and the effects of overpopulation. Comparisons were made between the two groups of couples and between those respondents desiring large families (four

or more children) and those desiring small families (two or fewer children).

Although on the average, the medical students intended to have more children than did the State college students, both groups desired more children than they felt ideal for the average American family (a mean of 2.5 children). Most of the students felt that overpopulation in the United States was a problem which

could become more severe in the future, but they placed much of the responsibility for the problem on those in lower socioeconomic classes. All couples practiced contraception.

Reasons for desiring large and small families were assessed and categorized. The large and small family groups were noted to differ in their definitions of large and small families. Those desiring large families were somewhat less concerned about the problems overpopulation might pose in the future and less concerned about the financial disadvantages of having a large family.

GLOGOW, ELI (University of Southern California, Los Angeles): *Effect of health education methods on appointment breaking. Study of patients with suspected glaucoma. Public Health Reports, Vol. 85, May 1970, pp. 441-450.*

The effect of different educational methods on the proportion of appointments broken by clients in a glaucoma screening program at the White Memorial Medical Center in Los Angeles, Calif., was tested. A total of 186 clients suspected of having glaucoma were randomly assigned to one of four educational methods. Each method was presented by the same nurse on an individual basis, in a private room, uninterrupted by intrusions. The four

methods were: (a) minimal information method, (b) intensive in-depth method, (c) facilitating or "problem-solving" method, and (d) control or no-information method.

These four methods were also contrasted with the traditional referral method, in which a secretary interpreted test results to the patient and made return appointments in a busy office subject to normal interruptions without using any planned educational presentations.

No statistically significant differences were found in the rates of broken appointments among patients exposed to the four educational methods. A statistically significant difference, however, was found between clients exposed to the four educational methods and clients exposed to the traditional referral method. This difference possibly resulted from the manner of presenting the information rather than from what the patients were told. The crucial elements of personal attention and "tender loving care" were apparently inherent in the four educational methods but missing in the highly impersonal, hastily conducted referral.

EDMUNDSON, WALTER F. (Public Health Service), DAVIES, JOHN E., and CRANMER, MORRIS: *DDT and DDE in blood and DDA in urine of men exposed to 3 percent DDT aerosol. Public Health Reports, Vol. 85, May 1970, pp. 457-463.*

A study was undertaken to determine the effect of occupational exposure on the levels of DDT and DDE in blood and DDA in urine of four men who sprayed aircraft interiors with an aerosol containing 3 percent DDT and 1 percent pyrethrin

daily during 4 days. After the first day little or no relationship was seen between levels of DDT and DDE and the amount of aerosol used or actual spraying time. Excretion of DDA correlated only slightly to amounts or spraying time. Rela-

tive heights of DDT and DDE in blood related more to biological differences of the men and to previous exposure.

Levels of DDE are considered to reflect the length of lifetime absorption of DDT, degree of saturation by DDT and DDE, and the intake-excretion balance of DDT and its metabolites. The DDA producing enzyme system appears to respond to rapidly changing concentrations of circulating DDT.